

self-induction and capacity the testing instrument is tuned to resonate with the vibration to be measured. The right point is shown, for instance, in the Fleming cymometer, by the point of maximum glow in a vacuum tube. From the known capacity and self-induction of the instrument, at this point, its oscillation constant can be calculated, and, therefrom, the wavelength obtained. For a description of these very interesting instruments and other valuable information we must, however, refer the reader to the book itself.

C. C. G.

#### THE SENSES OF INSECTS.

*The Senses of Insects.* By Auguste Forel. Translated by Macleod Yearsley. Pp. xvi+324; two plates. (London: Methuen and Co., n.d.) Price 10s. 6d. net.

COMPARATIVE psychology as a science is beset with more difficulties than most of its kindred natural sciences. One of the greatest of these difficulties is that man, a creature gifted with the most highly developed intelligence, endeavours to interpret and explain the actions of the lesser intellectually endowed members of the animal kingdom from their standpoint. However much he may endeavour to avoid assuming an anthropocentric attitude, he must invariably find himself seated again on his pedestal of intellectual preeminence. He cannot avoid it; it is the only criterion he possesses. This difficulty is never more apparent than when an effort is made to study the manifold activities of that most active of the animal groups, the insects, and especially those families in which social habits have attained such a high state of perfection. In the study of the senses of insects we are necessarily compelled to form inferences from our own sensory experiences, and the result is that we not only cannot obtain an adequate conception of their ordinary sensory powers, but are completely baffled by many organs of an undoubted sensory nature.

Dr. Forel's work on this subject is not so well known in this country as it deserves to be. This, no doubt, is due largely to the fact that most of it has been published in rather out-of-the-way journals. Those students whose interest in the subject has been stimulated by Lord Avebury's work will be grateful to Mr. Yearsley for having performed this "labour of love," as he describes his translation.

The direct translation and publication *in toto* of a series of writings of such a nature, however, has its disadvantages. The present volume contains writings which date from the year 1878 to 1906. We have, therefore, not only the author's natural changes of opinion, but also mistakes, in fact, which have been brought about by the gradual growth of entomological inquiry. For example, in the section on hearing, the author states that "only crickets and several other Orthoptera appear to perceive sounds," which, in the light of more recent work of Mayer, Child, and others on the acoustics of certain nematoceros Diptera, is not quite correct. Nor does the author devote sufficient attention to the thoracic and crural tympanal organs of the Orthoptera, so well described

by Graber, and of insects of other orders. To a present-day student of entomology a book on the senses of insects is incomplete without fuller reference to the morphological aspect of the subject, notwithstanding the lack of experimental studies. The author truly says, "for the human and animal brain, as well as for its functions, it demands that we shall use anatomical, physiological, biological, and psychological methods." The presence in insects of many problematic organs, which from their histological structure and connections appear to be of a sensory nature, such as, for example, those associated with the halteres of Diptera and the various chordonotal organs which have been described, does not detract from the difficulties which confront the student of these problems. The author pays little attention to these problematic organs, and, in view of the absence of experimental work on them, he is no doubt wise in not discussing them in the absence of facts, as some writers on the subject are accustomed to do. Where he treats with the senses of sight and smell he is more at home; his experiments are very interesting and valuable, and some of his results conclusive; it is in the description of these experiments that the value of the book lies rather than in his, in places, extensive polemical references to some of the work of others.

The last chapter, on judgment, mind, and reflexes, is one of the most interesting. The author is of the opinion that plastic reaction is primary, and that instinctive or automatic activity which predominates in the insects is secondary. He does not think that instinct can proceed from inherited habits, but that the automatism of all nervous activity, whether by selective heredity or individual habit, is a secondary phenomenon derived from primitively plastic habits, and in support of this he refers to the plastic origin of the slave-making instinct of the species of *Formica*.

We venture to think that the book would have been improved had the translator dispensed with a detailed account of the author's earlier work, the essentials of which might have been incorporated in the account of his later work; or had the author brought these earlier writings up to date with regard to our present knowledge of the morphological aspect of the problem, its value to the general reader would have been considerably enhanced thereby. With the exception of sub-oesophageal ganglion (p. 5) where supra-oesophageal is surely intended, and Chalcidites (p. 140) for Chalcidides, there are few mistakes of nomenclature in the work.

C. GORDON HEWITT.

#### FORESHORE PROTECTION.

*Coast Erosion and Foreshore Protection.* By John S. Owens and Gerald O. Case. Pp. 148. (London: The St. Bride's Press, n.d.) Price 7s. 6d. net.

THIS book consists principally of a reprint of papers on foreshore protection read before various societies, and of articles contributed to magazines.

Although it does not deal in such a comprehensive way with the subject of coast destruction and protection as the book on "The Sea Coast" published

by Messrs. Longmans about six years ago,<sup>1</sup> it contains a great deal of practical information that should be of great service to those interested in coast protection.

One of the authors is the son of the late Mr. Case, so well known for the very successful work he carried out in protecting and saving from destruction the coast land at Dymchurch, and afterwards for his advocacy of the system of low groynes.

The book is divided into fourteen chapters, dealing respectively with forces acting on coasts and the sea bed, transporting power of running water, movement of materials composing the foreshore and bed of the sea, causes of erosion, protection works, materials of construction, groynes, sea walls, sand dunes.

The authors very properly point out that there is no one method of protection that can be applied to all coasts, but that each shore must be considered on its merits, and that it is only after due consideration has been given to the special circumstances which may influence the effect of the sea upon any particular shore that the proper remedy can be designed.

By way of example, it has been frequently said that it is useless to erect groynes upon a foreshore where there is no material to collect. But there are other matters that require consideration besides the actual collection of material. On many sandy coasts low groynes may serve a useful purpose by preventing denudation and the formation of swills and lows.

With regard to the sometimes debated question of high and low groynes, the writers of this book are fully in accord with the author of "The Sea Coast" in advocating the use of low groynes both on account of efficiency, convenience, and economy. With regard to the direction to be given to groynes, the authors do not see any reason for departing from a direction at right angles to the shore, and the majority of the engineers who gave evidence before the Royal Commission on Coast Erosion were of the same opinion, although some stated that, as a matter of experience, they had found the best results were obtained where the groynes were directed away from the side from which the prevailing winds came.

As to the proper distance between groynes, this has been found by the experience of the authors to be the distance between high and low water mark, or practically the length of the groyne. Experience has fully shown that the carrying up of the groyne from low water to about half tide level, as practised in many instances by the late Mr. Case, is not sufficient, as the water is apt to work round the end and make gullies, but that in every instance the groynes should extend so far as the high spring tides reach.

The chapter on ferro-concrete groynes contains much useful information on the application of this material to sea defence work, and gives illustrations and cost of works carried out for the protection of the coast of Sussex. The cost of these groynes is given as twenty shillings a foot run, which compares favourably with timber.

<sup>1</sup> "The Sea Coast, Destruction, Littoral Drift, Protection." (London: Longmans and Co., 1902.)

## OUR BOOK SHELF.

*The Discovery and Settlement of Port Mackay, Queensland.* By H. Ling Roth. Pp. viii+114; 82 figs., 4 maps and charts. (Halifax: F. King and Sons, Ltd., 1908.)

PORT MACKAY in Queensland was discovered by Captain Mackay in 1860. The town was founded in 1862, and declared a port of entry in 1863, and is now the chief seat of the sugar industry in Queensland. The early history of a colonial settlement is sometimes of great interest, but it is often impossible to recover it, excepting where, as fortunately is usually the case in Australia, the young town promptly establishes a local newspaper. Port Mackay had the advantage of including amongst its residents Mr. H. Ling Roth, the author of the standard work on the aborigines of Tasmania; he was at one time secretary of the Mackay Sugar Planters' Association, and in this volume gives a monograph of the history of the town up to 1867, whence the story is continued in the columns of the local Press. He describes the discoveries along the Queensland coast up to 1844, and the exploration of the coastal districts by land from 1813 to 1859; and he explains how it happened that so valuable a locality as Port Mackay was missed by all explorers until 1860.

The volume is most valuable as a contribution to the historical geography of Australia. It includes a collection of portraits and interesting sketches of the early settlers. It tells several good stories, as of the sarcastic Mackay magistrate, who, when joined on the bench by a distrusted local J.P., asked his colleague whether he appeared for the plaintiff or the defendant. In the appendices, Mr. Ling Roth gives a valuable account of the aborigines of the district and of its natural history. He objects to calling the black-fellows aborigines, as he holds that Australia was first occupied by a negroid people who have been supplanted by the present race. This view, well known from its adoption by Sir William Flower, appears to be now generally discredited, owing to the lack of evidence in its support. The author undertakes a forlorn hope in his objection to Australian lizards being called Iguanas—often abridged to "Goanas"—because they do not belong to the genus *Iguana* as now restricted. The name may conveniently be retained popularly for the lizards formerly included in the Iguanidæ, and it is not so incorrect zoologically as those of "native bear" or native "cat."

There are specially interesting notes on the habits of some of the snakes and of the crocodiles, and the author appears disposed to throw doubt on the established habits of crocodiles of other continents from the different behaviour of the sluggish Queensland *Crocodilus porosus*.

Stories are often told of the wanton extermination of the Australian aborigines by the colonists. It is interesting, therefore, to learn from Mr. Roth that a collector on the coast from 1863 to 1873 endeavoured in vain to get an aboriginal skeleton for a well-known European museum. His failure shows that at least in the Port Mackay district there is no truth in the legends about the wholesale shooting of the aborigines. J. W. G.

*Through the Depths of Space.* A Primer of Astronomy. By Hector Macpherson, jun. Pp. viii+123; illustrated. (Edinburgh and London: William Blackwood and Sons, 1908.) Price 2s. net.

In this small primer the author has attempted to give an outline of all the main features of the solar system, comets and meteors, and the stellar universe. As a journalistic collation the result is not without merit, but as a "primer," presumably for persons previously